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DEPARTMENT OF AGRICULTURE

ALVA AGEE, Secretary

BUREAU OF STATISTICS AND INSPECTION

CIRCULAR

No. 26

Nursery Insects

Trenton, N. J., April, 1919

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The More Important Nursery Insects in New Jersey

BY HARRY B. WEISS

This circular is intended primarily for nurserymen, and, in view of the fact that at least 90 per cent of the nursery area of New Jersey is devoted to the growing of ornamental plants, only those insects injurious to such plants have been treated. All of the species mentioned herein have been found in nurseries.

THE LEOPARD MOTH

(*Zeuzera pyrina* Fab.)

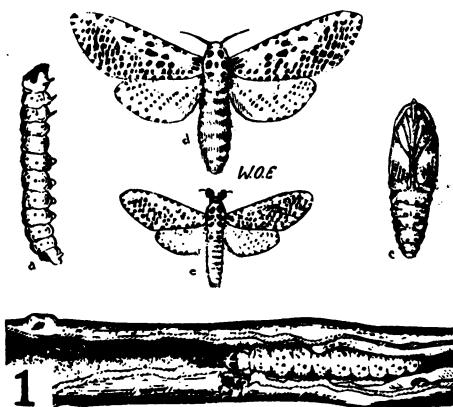


FIG. 1. WOOD LEOPARD MOTH

a, larva ; b, larva in burrow ; c, pupa ; d, female moth ; e, male moth
(N. Y. State Coll. Forestry Bul. 26)

GENERAL APPEARANCE.—The boring larva which is responsible for the injury is a fleshy caterpillar, pale yellow with a pinkish tinge and having the body covered with large dark tubercles. The adults are striking moths with white wings spotted with black dots, the females being larger than the males.

LIFE HISTORY.—The moths appear in June and deposit eggs singly and in groups of three or four up to the extent of as many as 800. These are laid in crevices in the bark and hatch in about ten days. The larvæ then penetrate the wood and make tunnels in the heart of twigs and larger branches or trunks. When too large for one branch the larva enters another. Pupation takes place the second May after the eggs have hatched, thus the larva requires nearly two years to complete its growth. The presence of the larva in a branch is indicated by the frass, chips and excrement near the entrance of the burrow and by the wilting and breaking off of infested limbs.

FOOD PLANTS.—This pest attacks practically all kinds of suitably sized woody plants except evergreens, and in New Jersey nurseries near cities it has been found particularly in oak, lilac, mountain ash, maple, ash and apple stock.

CONTROL.—Infested twigs and branches should be cut and burned. Carbon bisulfide can be injected into the burrows where cutting is not possible or a pliable wire used if the larva has not made a long or crooked burrow.

THE BAGWORM

(*Thyridopteryx ephemeraeformis* Haw.)

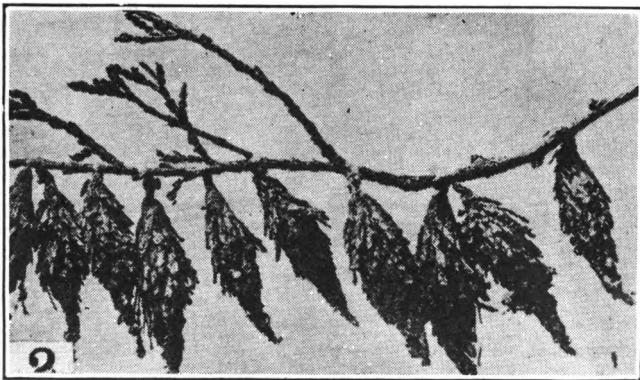


FIG. 2. BAGWORM CASES ON ARBOR VITÆ TWIG
(Ohio Agr. Exp. Sta.)

GENERAL APPEARANCE.—This pest is readily recognized by the bag-like coverings of the caterpillars hanging from the foliage. The bags are composed of bits of dried leaves and bark held together by a silken fabric and are conical in shape and from one to two inches long.

LIFE HISTORY.—The bagworm overwinters in the egg stage within the old female bag. In the spring the young hatch from the eggs and make their way to the nearest leaves and begin feeding and constructing cases or bags which they carry with them and which serve as a protection. Toward the end of the summer the larva is full grown and it then attaches its bag to a twig and within transforms to a pupa, which stage lasts about three weeks. The males then emerge and mate with the females which are wingless and which remain in their bags. The females then deposit eggs, work their way out and die.

FOOD PLANTS.—This insect is a general feeder but appears to be fond of evergreens, especially arbor vitæ. It feeds freely, however, on maple, willow, sycamore, poplar and many other trees.

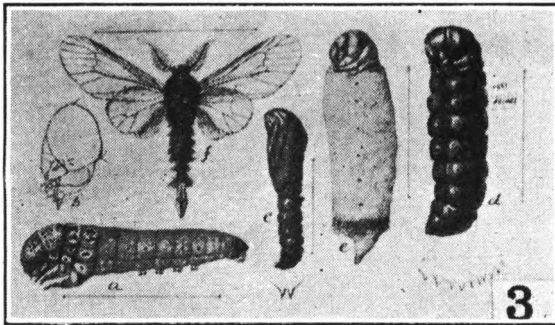


FIG. 3. BAGWORM

a, full grown larva ; c, male pupa ; d, female pupa ; e, adult female ; f, adult male
(From Howard)

CONTROL.—Hand-picking and burning the bags in winter will destroy the eggs. Spraying with arsenate of lead powder, $1\frac{1}{2}$ pounds to 50 gallons of water, will kill the larvæ while they are feeding.

THE WHITE-MARKED TUSSOCK MOTII

(*Hemerocampa leucostigma* Sm. and Ab.)

GENERAL APPEARANCE.—In nurseries near towns these insects are sometimes quite abundant. The caterpillar is gray in general color and the back is ornamented with a row of 4 brush-like tufts of white hair. Behind these are 2 bright red elevations. At each side is a velvety black band bordered with yellow. The head is bright red and each end of the body bears 2 pencils of stiff black hairs. The male moth is ashy gray in color marked with black, while the female is wingless, with a thick, somewhat oval, light gray body.

LIFE HISTORY.—Overwintering takes place in the egg stage. The eggs are laid in masses of 300 or more and covered with a white, frothy mass secreted by the female. These masses are laid on trunks of trees, fence posts, sides of houses and other places. The young caterpillars appear about the last of May and feed on the leaves, at first skeletonizing them but later eating everything except the mid-rib and main veins. Very often the larvæ suspend themselves from the leaves by silken threads. They become full grown in four or five weeks, at which time they are about $1\frac{1}{2}$ inches long, and then construct cocoons in crevices of rough bark. The pupal stage lasts about two weeks, after which the moths emerge. The wingless female then deposits her eggs on the outside of her cocoon in which stage the insect overwinters.

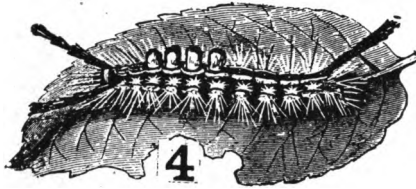


FIG. 4. WHITE-MARKED TUSSOCK MOTH
(Ill. Agr. Exp. Sta. Bul. 151)

FOOD PLANTS.—Almost every kind of a tree except an evergreen is subject to attack.

CONTROL.—Spray with powdered arsenate of lead at the rate of 2 pounds to 50 gallons of water. Trees from which the eggs have been removed during the winter or fall can be kept free of the caterpillars which may occur on neighboring trees by banding them with cotton batting or tanglefoot applied on paper. On trees with a thick bark, the tanglefoot can be applied direct.

THE APPLE-TREE TENT-CATERPILLAR

(*Malacosoma americana* Fab.)

GENERAL APPEARANCE.—Unsightly nests or webs occurring where the branches fork are evidences of the presence of this pest. The full grown caterpillar is about 2 inches long, black, with a light stripe down the back and dots of blue and white along the sides, and is clothed with fine yellowish hairs. The moths are dull, reddish-brown, marked on the front wings by two, almost parallel, oblique, whitish lines, and measure from $1\frac{1}{4}$ to 2 inches across the wings.

LIFE HISTORY.—The winter is passed in the egg stage, the eggs being laid in masses of several hundred, each mass being $\frac{1}{2}$ inch or more in length and usually encircling a small branch as a band. Each mass is covered with a varnish-like material and has rounded ends. These hatch when the first buds open and the larvæ feed on the foliage and construct a silken nest which sometimes becomes quite large. During storms and the heat of the day the larvæ remain in the nest and feed as a rule only early in the morning, in the evening



FIG. 5. EGG MASSES OF APPLE TREE
TENT-CATERPILLAR
(N. Y. State Coll. Forestry Bul. 26)



FIG. 6. NEST OF APPLE TREE TENT-
CATERPILLAR
(Conn. Agr. Exp. Sta. Bul. 177)

or at night. When full grown they crawl to some protected place and spin their oval, white cocoons which are about 1 inch in length. The pupal period lasts about 3 weeks, the moths emerging the last of June and first of July and depositing eggs soon afterward. There is only one generation a year.

FOOD PLANTS.—This species is common at times on wild cherry trees, on trees in neglected orchards and will also infest beech, birch, oak, willow and poplar.

CONTROL.—Spraying with arsenate of lead (powdered) $1\frac{1}{2}$ pounds to 50 gallons of water will kill the larvæ. This should be done while

the caterpillars are small. The nests can be destroyed by wiping them out or burning them while the larvæ are inside. The egg masses are plainly visible and can be pruned off and destroyed.

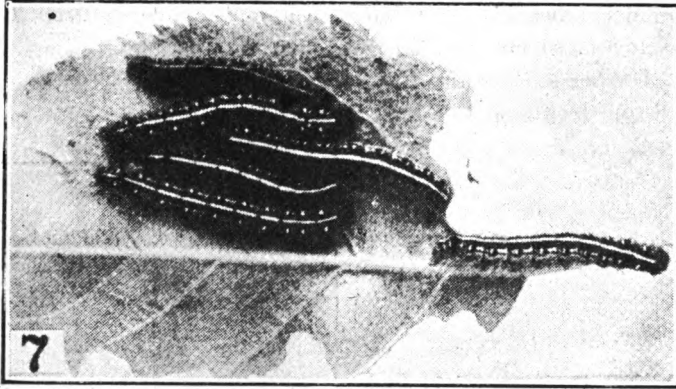


FIG. 7. PARTLY GROWN TENT-CATERPILLARS
(Conn. Agr. Exp. Sta. Bul. 177)

THE FOREST TENT-CATERPILLAR
(*Malacosoma disstria* Hubn.)

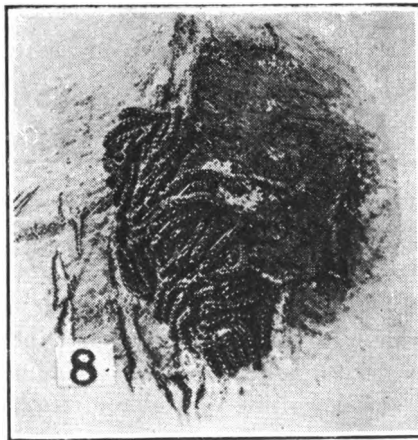


FIG. 8. FOREST TENT-CATERPILLARS ON TRUNK OF TREE
(N. Y. State Agr. Exp. Sta. Bul. 159)

GENERAL DESCRIPTION.—The caterpillar can be distinguished from the apple tent-caterpillar by the row of somewhat diamond-shaped, whitish spots down the middle of the back and by the fact that it feeds

mostly on plants rarely attacked by the apple tent-caterpillar. The moths are light buff-colored insects with a wing spread of about $1\frac{1}{8}$ or $1\frac{1}{4}$ inches.

LIFE HISTORY.—The egg belts are smaller than those of the apple tent-caterpillar and have the ends terminating abruptly. Overwintering takes place by the developed caterpillar within the egg. Hatching occurs later than that of the apple tent-caterpillar and the larvæ feed on the developing leaves. When not feeding they congregate in clusters on the limbs, and when full grown they scatter and spin yellowish white cocoons, on the trees, under stones, in fence corners, etc. The pupal stage lasts about 2 weeks, the moths appearing during July and soon after the overwintering eggs are laid.

FOOD PLANTS.—Oak, sugar maple, poplar, and, to a less extent, linden, dogwood, locust, sweet gum, hickory, black walnut, sour gum, plum, cherry and peach.

CONTROL.—Apply arsenate of lead (powder) $1\frac{1}{2}$ pounds to 50 gallons of water, early and thoroughly. During the fall or winter clip off the twigs bearing egg belts.

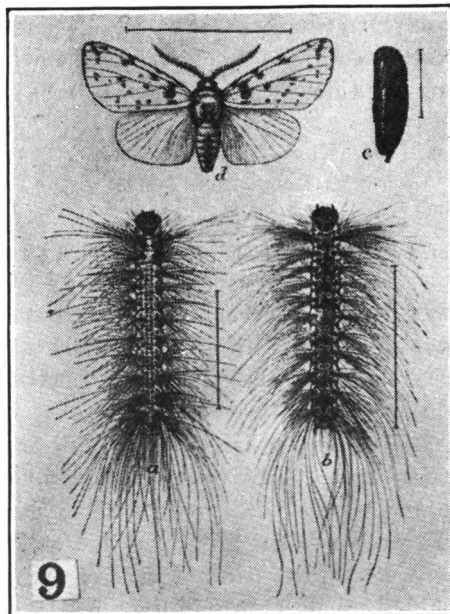


FIG. 9. FALL WEB-WORM
a, b, larvæ; c, pupa; d, moth
(N. H. Agr. Exp. Sta.)

THE FALL WEB-WORM

(Hyphantria textor Harris)

GENERAL APPEARANCE.—A large, conspicuous web occurring in late summer and fall inclosing a number of leaves and twigs of a branch, together with a colony of caterpillars indicates the presence of this species.

LIFE HISTORY.—The moths deposit their eggs in patches of several hundred, each on the under-side of the leaves near the end of a branch, and the caterpillars upon hatching start to web up the foliage, spreading from branch to branch and skeletonizing the leaves. When almost full grown they leave the web and scatter, eating almost anything green. They are covered with long, straight hairs arranged in tufts and are of a pale yellowish or grayish to dark bluish-black color. When mature, they either pupate a short distance under the soil or under shelter above ground.

FOOD PLANTS.—This species is a universal feeder and may be found on almost any plant in a nursery.

CONTROL.—Destroy the webs when they are small or spray with powdered arsenate of lead, using 1½ pounds to 50 gallons of water.

THE SAN JOSE SCALE

(Aspidiotus perniciosus Comst.)

GENERAL APPEARANCE.—This appears as a circular, grayish scale about 1-16 inch in diameter, with a central, dark nipple and one or more grayish or yellowish rings; it is frequently surrounded by smaller nearly black scales.

LIFE HISTORY.—The winter is passed by this insect in a partly grown dormant condition. Activity is resumed upon the arrival of warmer weather and the females produce about 400 young over a period of about six weeks. These are tiny yellow creatures which soon establish themselves on various parts of the tree and begin to feed by inserting their hair-like mouth parts in the sap. In time these young become completely covered by a protective scale coating. Three or four generations occur in a season.

FOOD PLANTS.—This scale has a wide range of food plants, and in New Jersey nurseries has been found most commonly on left-over fruit stock, mountain ash, lilac, snowberry, cornus, flowering peach and apple, currants, rose, willow, poplar, choke-cherry and juneberry.

CONTROL.—Spray with commercial lime-sulfur at the rate of 1 part to 9 parts of water while the trees or shrubs are dormant. Miscible oils are also satisfactory, but their continued use on stone fruits is not advised.

THE OYSTER-SHELL SCALE

(*Lepidosaphes ulmi* Linn.)

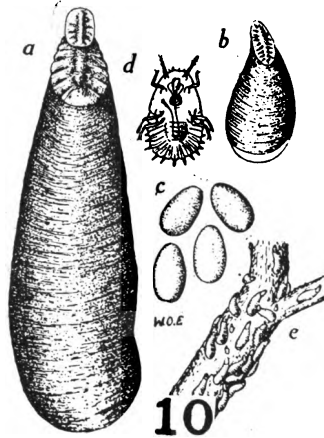


FIG. 10. OYSTER-SHELL SCALE

a, adult female scale; b, male scale; c, eggs; d, newly hatched larva; e, female scales on bark

(N. Y. State Coll. Forestry Bul. 26)

GENERAL APPEARANCE.—This is a brownish or dirty white oyster-shell shaped scale about $\frac{1}{8}$ inch in length.

LIFE HISTORY.—This species winters in the egg stage, the small whitish eggs being protected by the old female scale, each one covering from 30 to 100 eggs. These hatch in the spring and the yellowish-white young select fresh places on the bark, insert their thread-like mouth-parts and secrete a covering. In northern New Jersey there is but one generation; in the southern part of the state two have been noted.

FOOD PLANTS.—This insect has a wide range of food plants, often occurring abundantly on willow, poplar, lilac, mountain ash, maple, currant, etc.

CONTROL.—Thorough spraying with commercial lime-sulfur 1 to 9 during the dormant season is advised. This material appears to loosen the scales from the bark so that the eggs are either exposed to the weather or blown away. Badly infested small limbs and branches should be pruned off and destroyed.

THE SCURFY SCALE

(*Chionaspis furfura* Fitch)

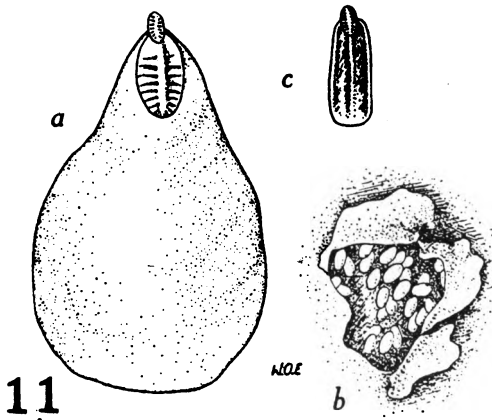


FIG. 11. SCURFY SCALE

a, adult female scale; b, eggs; c, male scale
(N. Y. State Coll. Forestry Bul. 26)

GENERAL APPEARANCE.—The female scales are somewhat flat, pear-shaped, of a grayish-white color and about $\frac{1}{8}$ inch long. When numerous the infested bark has a grayish, scurfy appearance. The male scale is much smaller, snowy white and thread-like in outline.

LIFE HISTORY.—The life history is similar to that of the oyster-shell scale.

FOOD PLANTS.—This scale infests apple, pear, lilac, poplar, currant, mountain ash and many other plants.

CONTROL.—Prune off badly infested limbs. Spray with lime-sulfur during the dormant season as recommended for oyster-shell scale.

THE COMMON RED SPIDER

(Tetranychus telarius Linn.)

GENERAL APPEARANCE.—A discoloration or spotting of the foliage accompanied by small, spider-like creatures about 1-75 inch in length indicates an attack by this species. In severe infestations the leaves become dry and turn brown.

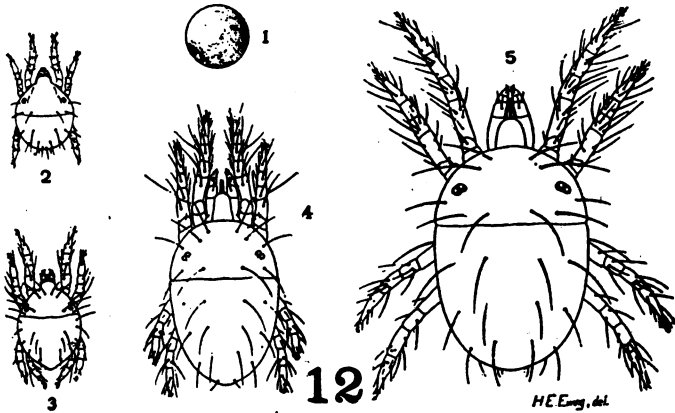


FIG. 12. ALL STAGES OF THE RED SPIDER
(After Ewing)

LIFE HISTORY.—From 10 to 50 small spherical glassy eggs are loosely attached about the webs which the mites spin. These hatch in from 3 to 7 days and the young pinkish-white mites have only three pairs of legs. After the first moult they are supplied with four pairs. They moult three times before becoming adults, each stage lasting 3 or 4 days. The length of life of an adult is about 3 or 4 weeks, but varies somewhat, depending on the temperature.

FOOD PLANTS.—It has a wide range of hosts, occurring on ash, elm, rose, larch, maple, walnut, willow, spruce, various evergreens and many greenhouse and market crops.

CONTROL.—Spray with "Black leaf 40" tobacco extract 1 part to 500 parts of water plus 2 or 3 pounds of soap to 50 gallons of the mixture. Several nurserymen claim to have secured good results on infested evergreens by using commercial lime-sulfur at a strength of 1 part to 40 parts of water.

THE LOCUST BORER

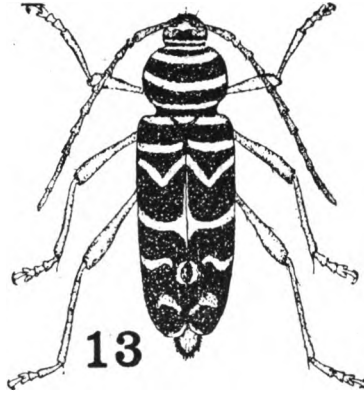
(Cyllene robiniae Forst)

FIG. 13. THE LOCUST BORER
(N. Y. State Coll. Forestry Bul. 26)

GENERAL APPEARANCE.—The parent beetle is about $\frac{3}{4}$ inch long and brown, conspicuously marked with 3 straight yellow bands across the thorax and 5 broken or irregular yellow bands across the wing covers. The appearance of fine brownish dust and drops of sap on the bark is the first evidence of attack. More gum and dust appear later and badly infested trees have a dwarfed and sickly foliage. The larva is a whitish, thick-bodied segmented grub about 1 inch long when full grown.

LIFE HISTORY.—The beetles appear in September on locust trees and golden rod, feeding on the pollen. The eggs are laid in crevices under loose bark and hatch in about one week. The larvæ do not appear to feed much in the fall and hibernate in small cavities in the outer bark. They become active again in the spring and burrow until July or August, then pupating and later emerging.

FOOD PLANT.—Black locust.

CONTROL.—Cut and destroy the infested parts in May and June. See Carbolineum treatment under Poplar and Willow Borer (page 16).

THE LOCUST LEAF MINER

(Chalepus dorsalis Thunb.)

GENERAL APPEARANCE.—The adult beetle is about $\frac{1}{4}$ inch long, with black head and a median, triangular area, widening on wing covers also black, and the remainder of the back orange-red. The larva is yellowish-white with black head, and the sides of the body are notched.

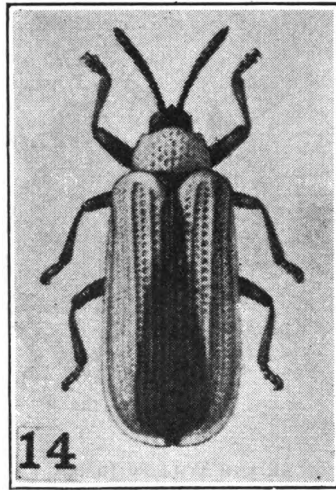


FIG. 14. THE LOCUST LEAF MINER
(Ky. Agr. Exp. Sta. Bul. 200)

LIFE HISTORY.—The beetles winter in various sheltered places, appear as soon as the locust leaves have developed and eat small oblong holes in them. The short oval, flattened eggs are laid on the under leaf-surface and covered with an excrement-like secretion. They hatch in about a week and the larvæ enter the leaf and feed within for about 3 weeks, finally pupating within the mine. The mine is visible on both leaf surfaces, being slightly tinged with brown, with irregular, undulated margin.

FOOD PLANTS.—Black locust is preferred. It has also been recorded as attacking the foliage of oak, beech, birch, hawthorne, etc.

CONTROL.—Spray thoroughly with $1\frac{1}{2}$ pounds of powdered arsenate of lead to 50 gallons of water about the time the leaves are full grown.

THE POPLAR AND WILLOW BORER

(Cryptorhynchus lapathi Linn.)

GENERAL APPEARANCE.—Indications of the work of this borer consist of dead or dying limbs, the presence of irregular swollen places and dead cracked patches of bark on limbs and trunk. The parent is a broad-snout beetle about $1/3$ inch long, dark brown in color, mottled with gray and with the posterior end of the back gray, yellow or pink.

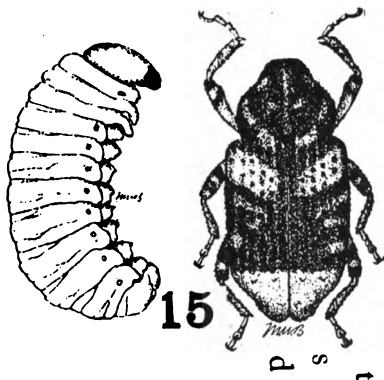


FIG. 15. THE POPLAR AND WILLOW BORER, LARVA AND ADULT
(N. Y. State Coll. Forestry Bul. 26)

LIFE HISTORY.—There is one brood a year. The beetles start to emerge in July and during August and September deposit eggs in the older parts of the tree. These hatch in from 18 days to 3 weeks and the larvæ feed on the inner bark until cold weather, when they hibernate as small grubs just under the bark. Activity is resumed in the spring and irregular channels are eaten out until the grubs become full grown when pupation takes place.

FOOD PLANTS.—Poplar and willow.

CONTROL.—To avoid injury, new plantings of poplar and willow should not be set out near old blocks. Cut out and destroy infested parts in June. This is a difficult pest to control, but recent experiments indicate that carbolineum emulsion *(1 lb. sodium carbonate, 1

*Matheson, R., 1915. Experiments in the control of the poplar and willow borer (*Cryptorhynchus lapathi*). In Jour. Econ. Ent., v. 8, pp. 522-525.

quart hot water, 1 quart carbolineum avenarius) painted on infested trees in December or April, penetrates to such an extent that the larvæ working in the bark are killed.

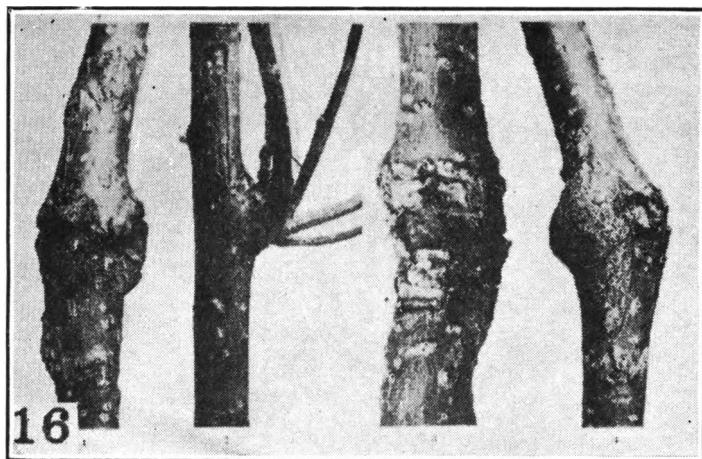


FIG. 16. INJURY TO NURSERY STOCK BY POPLAR AND WILLOW BORER
(N. Y. State Agr. Exp. Sta. Bul. 286)

THE COTTONWOOD LEAF BEETLE

(*Melasoma scripta* Fab.)

GENERAL APPEARANCE.—Dirty, yellowish, spotted with black slug-like larvæ feeding on the under-surfaces of the leaves accompanied by a peculiar odor which they emit, may mean an infestation by this insect.

LIFE HISTORY.—The hibernating beetles appear about the last week in May, feed on the young leaves and shoots and deposit from 25 to 50 lemon-colored eggs on the under-surface of the leaves. These hatch in 10 days to brown or black larvæ which skeletonize the leaves, and as they increase in size they change to a dirty yellowish tint with a double row of dark brown dots on the back. They become full grown in about 15 days and transform to pupæ which remain hanging on the leaves. Within two weeks the beetles appear, giving rise to a second brood.

FOOD PLANTS.—Poplar and willow.

CONTROL.—Spray with powdered arsenate of lead at the rate of $1\frac{1}{2}$ pounds to 50 gallons of water, applying the material to the lower leaf-surfaces.

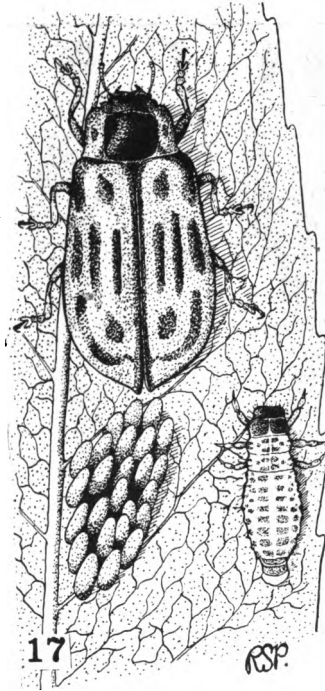


FIG. 17. THE COTTONWOOD LEAF BEETLE; EGGS, LARVA AND ADULT
(N. J. Agr. Exp. Sta. Circ. 15)

THE IMPORTED POPLAR AND WILLOW BEETLE

(*Plagioder a versicolor a* Laich.)

GENERAL APPEARANCE.—The adult is a small, metallic-blue beetle which feeds on the foliage, eating holes through the leaves. The larvæ which are dark colored and slug-like, and emit a peculiar odor, skeletonize the leaves from the under-surface.

LIFE HISTORY.—The adults hibernate under bark, etc., during the winter and emerge in late April or early May and deposit lemon yellow eggs in irregular masses of from 12 to 30 on the under-sides of the leaves. These hatch in from 3 to 5 days, and the larvæ feed on the foliage. When full grown they attach themselves to the under-surface of a leaf and transform to pupæ which are yellowish brown with dark markings. There are 5 larval stages requiring from 3 to 6 days each,

and about one month's time is required for a complete cycle. There are two complete broods in addition to the hibernating beetles.

FOOD PLANTS.—Poplar and willow.

CONTROL.—This species is undoubtedly susceptible to timely treatments of arsenate of lead applied to the under leaf-surfaces.

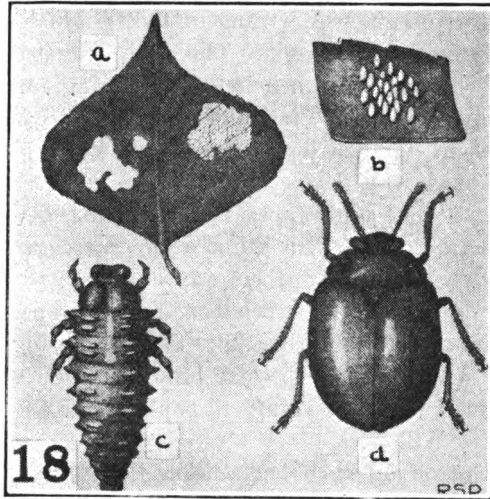


FIG. 18. THE IMPORTED POPLAR AND WILLOW BEETLE
a, leaf showing larval and adult feeding; b, egg mass; c, full grown larva; d, adult beetle

THE YELLOW SPOTTED WILLOW SLUG

(*Pteronus ventralis* Say)

GENERAL APPEARANCE.—The adult is a brownish black saw-fly marked with yellowish white. The larvæ are slightly over $\frac{1}{2}$ inch long; greenish-black with heart-shaped yellowish spots on each side.

LIFE HISTORY.—The oval, whitish eggs are partly inserted under the upper-surface of the leaf tissue, resulting in blister-like swellings. After hatching, the young slugs feed on the foliage, usually somewhat close to each other, each assuming a characteristic curved position. They become full grown in about 3 weeks and then descend to the ground and build a dark brown cocoon in which to pupate. Adults appear in about a week and give rise to a second brood.

FOOD PLANTS.—This species occurs on poplars and willows.

CONTROL.—Spray with arsenate of lead (powdered), $1\frac{1}{2}$ pounds to 50 gallons of water.

WILLOW SHOOT SAWFLY

(*Janus integer* Nort.)

GENERAL DESCRIPTION.—A wilting of the terminal shoots may be due to the activities of this insect. The adult is a slender, wasp-like insect with a body about $\frac{1}{2}$ inch long and a wing spread of 1 inch. It is black except for a broad orange band at the base of the abdomen. The larva is about $\frac{3}{8}$ inch long, legless and white with the thorax somewhat thickened.

LIFE HISTORY.—The adult appears in the spring, deposits eggs in a shoot and then girdles the stem below where the eggs were inserted. Upon hatching the larvæ work their way down the pith, and by fail complete their growth. They then construct cocoons in which the winter is passed, transforming to adults the next spring. The tips of infested shoots wilt down and become brown and dry. A closely related species causes a similar injury to poplar.

FOOD PLANT.—Willow.

CONTROL.—Cut off infested shoots below the injury.

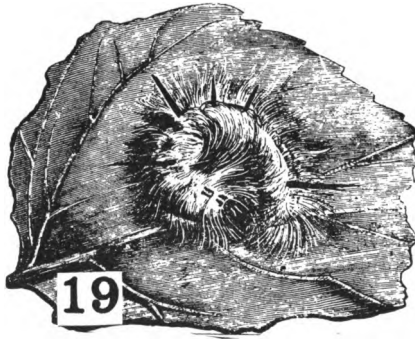


FIG. 19. THE YELLOW POPLAR CATERPILLAR
(Ill. Agr. Exp. Sta. Bul. 151)

THE YELLOW POPLAR CATERPILLAR

(*Apatela populi* Riley)

GENERAL APPEARANCE.—A large, light yellow or pale green, very hairy caterpillar bearing five long pencil-like tufts of black hairs on

the middle line of the back, is sometimes abundant on poplar and willow trees.

LIFE HISTORY.—The caterpillar is about $1\frac{1}{2}$ inches long and slug-gish in movement. It feeds on the leaves in midsummer and again in fall and when full grown spins a loose pale yellow cocoon of silk, interwoven with its own hairs. These cocoons are usually placed in bark crevices or in other sheltered places. The winter is passed in this stage, the moth appearing the following May.

FOOD PLANTS.—Poplar and willow.

CONTROL.—Spray with arsenate of lead powder at the rate of $1\frac{1}{2}$ pounds to 50 gallons of water.

THE ELM LEAF BEETLE

(*Galerucella luteola* Mull.)

GENERAL APPEARANCE.—This well-known pest is a small beetle about $\frac{1}{4}$ inch in length, with orange or greenish yellow wing covers bearing a dark strip on each. The full-grown grubs are dark with a dirty yellowish broad stripe down the back.

LIFE HISTORY.—The beetle passes the winter as an adult in any protected location, sometimes selecting garrets, outhouses and the like. They appear on the trees about the time the first leaves are unfolding and eat irregular holes in them. Clusters of orange-colored eggs are laid on the lower leaf-surfaces, each cluster containing from 5 to 30. These hatch in about a week and the larvæ feed only on the under parts, leaving the veins and upper epidermis untouched. They become full grown in early July and pupate in cracks in rough bark, in the grass or under other partial shelter. A second generation occurs and the adults of this hibernate.

FOOD PLANT.—Elm.

CONTROL.—In late years this beetle has been decreasing in numbers. If necessary it can be controlled by spraying with 2 pounds of powdered arsenate of lead to 50 gallons of water early in the spring. This will kill the beetles before they have deposited their eggs. A similar spray applied to the under leaf-surfaces can be used against the larvæ.

THE SPINY ELM CATERPILLAR

(Euvanessa antiopa Linn.)

GENERAL APPEARANCE.—The caterpillar when full grown is 2 inches in length, blackish, with a row of red diamond-shaped spots on the back and armed with numerous branched black spines.

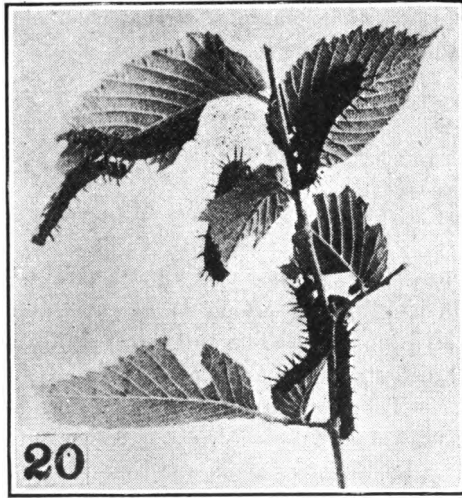


FIG. 20. THE SPINY ELM CATERPILLAR
(N. H. Agr. Exp. Sta. Bul. 67)

LIFE HISTORY.—The parent, which is known as the Mourning Cloak Butterfly, hibernates during the winter and in late May deposits reddish, ribbed eggs in ring-like masses around small twigs and branches. These hatch in about 2 weeks and the caterpillars feed in companies on the foliage and rapidly defoliate the branches. They complete their growth in late June or July and seek a sheltered place in which to transform to a spiny, grayish-brown, inactive chrysalis. Two weeks later the moths emerge and probably deposit eggs for a second brood.

FOOD PLANTS.—Elm and poplar.

CONTROL.—If the caterpillars are numerous, spray with powdered arsenate of lead, using 1½ pounds to 50 gallons of water.

THE ELM SCALE

(Gossyparia spuria Mod.)

This insect appears to be locally common on young elms. The pest is a dark red, soft, oval scale fringed with white and is about $\frac{1}{8}$ inch in length. It prefers crevices in the bark and is easily recognized. The young appear about the latter part of June and make their way to the under-sides of the leaves where they settle close to the mid-ribs. Before the leaves drop in the fall, they make their way to the larger branches and trunk and hibernate in the crevices. There is but one brood each year.

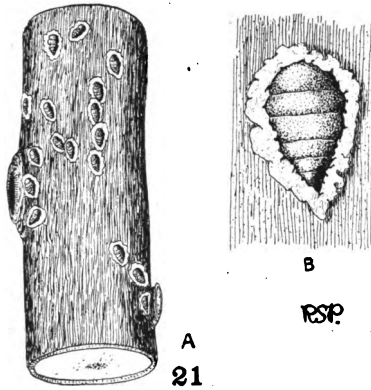


FIG. 21. THE ELM SCALE
a, branch infested; b, scale enlarged
(N. J. Agr. Exp. Sta. Circ. 15)

If only a few trees are infested, a stream of cold water applied with good pressure will wash off many from the trunk and larger limbs. A stiff brush can also be used to advantage in such places. As a summer spray, whale-oil soap is advised and during the winter the insects can be reached with a miscible oil.

THE ELM LEAF MINER

(Kaliosysphinga ulmi Sund.)

GENERAL APPEARANCE.—Mined, brown leaves later falling from the tree indicate the work of this miner. The adult is a small dark saw-fly which is seldom noticed, being only about $\frac{1}{8}$ inch long.

LIFE HISTORY.—The larva overwinters in a small, brown cocoon just below the surface of the soil. In the spring the adults emerge and deposit eggs in slits in the upper leaf-surfaces. These hatch in a week or 10 days and the larvæ mine out irregular galleries in the leaf tissue, causing the upper and lower tissues to die and turn brown. The larvæ become full grown during the first or middle of July, break through the leaf and drop to the ground which they enter.

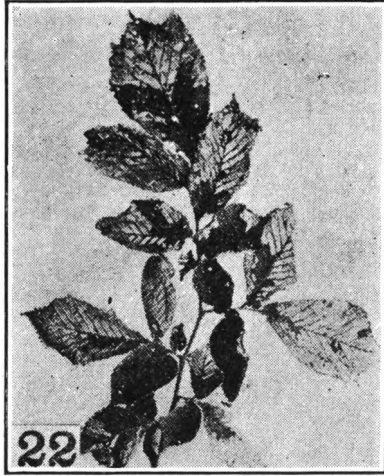


FIG. 22. LEAVES SHOWING WORK OF ELM LEAF MINER
(N. Y. (Cornell) Agr. Exp. Sta. Bul. 333)

FOOD PLANT.—Elm.

CONTROL.—Spray when the mines and larvæ are small with 1 pint of "Black-leaf 40" tobacco extract to 100 gallons of water in which is dissolved 5 pounds of soap. Cultivation of the soil under the infested trees might bury some cocoons deep enough to prevent the adults from escaping. The removal of the upper 2 inches of the soil will carry most of the cocoons away.

THE WALNUT CATERPILLAR

(*Datana integerrima* G. and R.)

GENERAL APPEARANCE.—This caterpillar is distinguished by its loose coat of soft whitish hairs, its habit of collecting in masses upon larger branches, and particularly by its habit of raising both ends of its body when at rest and jerking sidewise when disturbed.

LIFE HISTORY.—It winters as a reddish brown pupa in the soil emerging as a buff-brown moth with darker bands across the front wings the following summer. The females deposit eggs in clusters of 75 to 100 or more, and the young hatching from these feed in dense clusters, destroying all foliage as they go and completely stripping small trees in a short time.

FOOD PLANTS.—In addition to walnut, they feed also on butternut, hickory, beech, oak, willow, apple and thorn.

CONTROL.—Cut off the twig on which the insects are clustered and destroy by burning or tramping them into the soil; or spray with $1\frac{1}{2}$ pounds of powdered arsenate of lead to 50 gallons of water. A light spray of kerosene directed against the colony also will kill them.

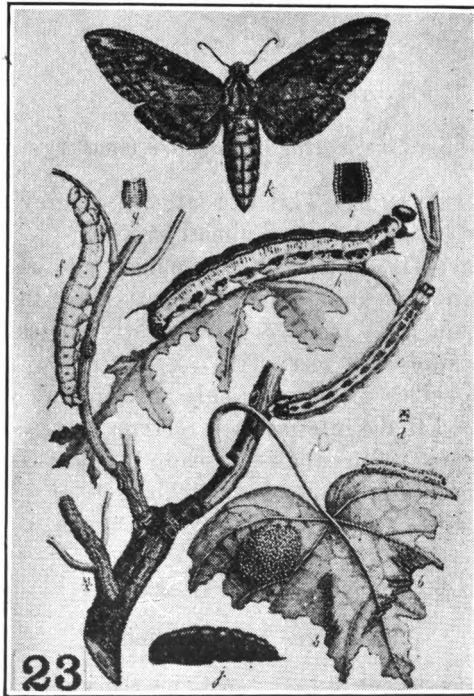


FIG. 23. THE CATALPA CATERPILLAR, IN ALL STAGES
(U. S. Dept. Agr. Rpt. 1881-82)

THE CATALPA SPHINX

(*Ceratonia catalpæ* Bdv.)

GENERAL APPEARANCE.—The large yellow and black larva with a horn at the posterior end of the body is easily recognized as it feeds on the leaves. The parent is a large grayish-brown hawk moth.

LIFE HISTORY.—The eggs are laid in masses on the under-sides of leaves, and on stems and branches, as many as 1,000 being found in a single mass. The larvæ moult 4 times, becoming variable in their markings as they grow older. Pupation takes place in the soil, the last generation overwintering in this way. A complete cycle during the summer requires about 6 weeks.

FOOD PLANT.—Catalpa.

CONTROL.—Because of their large size, the larvæ are readily seen, and on small trees hand-picking might be feasible. Spray with arsenate of lead powder, $1\frac{1}{2}$ pounds to 50 gallons of water. This insect is subject to the attacks of a number of parasites, and a sphinx caterpillar bearing a number of small white cocoons on its body indicates the presence of one of its enemies.

THE TULIP SOFT SCALE

(*Toumeyella liriodendri* Gmel.)

GENERAL APPEARANCE.—This is a large, livid gray to brown, convex scale nearly $\frac{1}{4}$ inch long and almost as wide.

LIFE HISTORY.—It winters in the young stage on the twigs, resumes growth in May and reaches maturity early in August. The young are born in large numbers during early September, and there is but one generation each year.

FOOD PLANT.—This scale occurs only on tulip and young trees are sometimes injured if the infestation is severe.

CONTROL.—Spray with whale-oil soap, 1 pound in 4 gallons of water, to kill the young as they are hatching.

THE ASH LEAF BUG

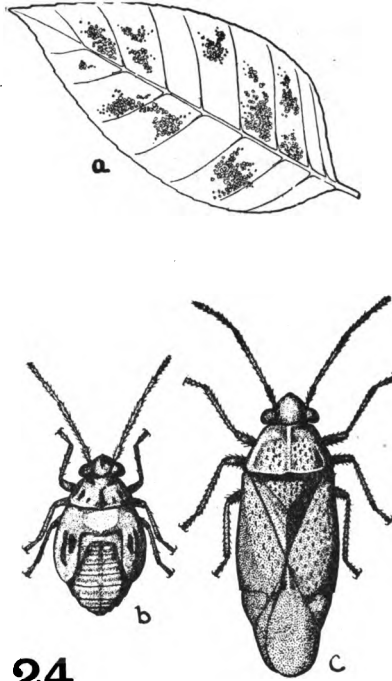
(*Neoborus amoenus* Reut.)

GENERAL APPEARANCE.—Light spots on the upper surfaces of ash leaves and somewhat curled and distorted terminal leaves, together with reddish actively moving wingless nymphs on the lower surfaces, indicate an infestation by this insect.

LIFE HISTORY.—The adult, light colored, active bugs about 5 mm. long and 2.5 mm. wide appear during June and deposit eggs in the midribs on the under-surfaces of young leaves, causing a curling and distortion. These hatch in about 10 days and there are 5 nymphal

stages, each requiring from 4 to 8 days, the average length of time consumed from egg to adult being about 5 weeks. Two broods occur in the state.

FOOD PLANTS.—This species has been found infesting the white ash, green ash, red ash and English ash.



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FIG. 24. THE ASH LEAF BUG
a, leaf showing feeding; b, nymph; c, adult
(N. J. Agr. Exp. Sta. Circ. 100)

CONTROL.—So far as known, no attempts have been made to control this actively moving insect by the application of insecticides, but the use of tobacco extract, 1 pint in 100 gallons of water, together with 5 pounds of whale-oil soap, as used for other species of active bugs, is suggested.

THE SYCAMORE LACE-BUG

(*Corythucha ciliata* Say)

GENERAL APPEARANCE.—The adult is somewhat oblong, flattened and about 3 to 4 mm. long, with the wing covers lace-like. The

nymphs are flattened, somewhat oval bugs, armed with various spines. All stages feed on the under leaf-surfaces and cause a discoloration of the upper surfaces by abstracting the sap.

LIFE HISTORY.—The adults hibernate during the winter under the loose bark of the host tree and in other nearby places of concealment. Upon the approach of warm weather, they migrate to the leaves, feed and deposit eggs in the leaf along the larger ribs and in the forks of the ribs. These hatch into nymphs of which there are five stages, all requiring a combined time of about 20 days in which to mature.

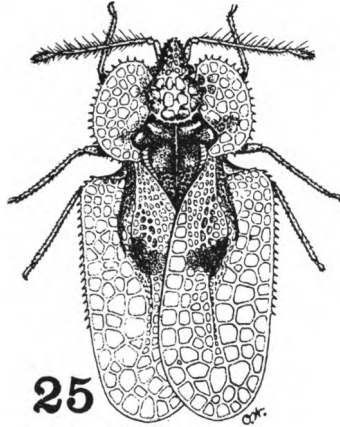


FIG. 25. THE SYCAMORE LACE BUG
(Okla. Agr. Exp. Sta. Bul. 116)

FOOD PLANT.—Sycamore.

CONTROL.—Spray with 1 pound of whale-oil soap to 6 gallons of water, taking care to hit the under leaf-surfaces.

THE WHITE PINE WEEVIL

(*Pissodes strobi* Peck)

GENERAL APPEARANCE.—The adult insect is a snout beetle about $\frac{1}{4}$ inch long, reddish brown to dark brown with two whitish spots on the posterior half of its back and white spottings on the sides and legs. Its presence is indicated by a dying of the leaders in July and by the discovery of white footless grubs boring in the inner bark and sapwood.

LIFE HISTORY.—The whitish, globular eggs are deposited under the bark of leading shoots during May and June and the grubs tunnel the

tissue. The first indication of the presence of this pest in the spring is the exuding of drops of resin from the punctures of the beetle. The eggs hatch in a week or ten days, and when full grown the grubs which are then about $\frac{3}{8}$ inch long pupate in the channels. The beetles emerge from the last of July through to early September.

FOOD PLANT.—White pine.

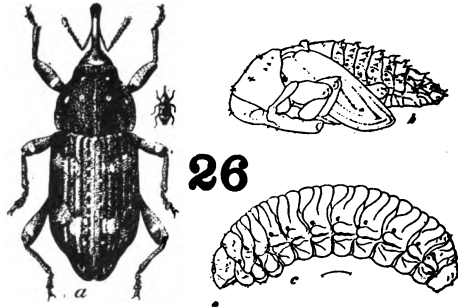


FIG. 26. THE WHITE PINE WEEVIL.

a, adult; b, pupa; c, larva

(A. D. Hopkins, U. S. Dept. Agr. Bur. Ent.)

CONTROL.—Cut and burn infested leaders during midsummer. Dr. E. P. Felt advises for large plantings of small trees the jarring of the beetles into a fair-sized insect net, at intervals of about 10 days, the first operation to start the first or second week of May and to be followed by two others.

THE PINE BARK APHID

(*Chermes pinicorticis* Fitch)

GENERAL APPEARANCE.—White pine limbs and trunks covered with patches of downy, flocculent material indicate the presence of the pine bark aphid.

LIFE HISTORY.—The eggs hatch in May, and the young emerge from their protective balls of woolly matter, and in the course of time attach themselves to the tender bark of young shoots. They become dark reddish brown and the woolly secretion from their bodies soon hides them. There are several broods during a summer and the winter is also passed by some wingless females.

FOOD PLANT.—White pine.

CONTROL.—Spray with tobacco extract, 1 part to 500 parts of water, adding 3 pounds of soap to every 50 gallons. Apply with enough force to penetrate the woolly covering.

THE PINE LEAF SCALE

(Chionaspis pinifoliae Fitch)

This scale is often common on the needles of pine trees and does most of its damage by destroying the ornamental value of the trees. The scales are sometimes so abundant as to whiten almost every needle and this detracts much from the appearance of the pine. The insect is snowy white with a yellowish place at its anterior end. It winters in the egg stage, the eggs hatching about the last of May. There are two broods which overlap considerably.



FIG. 27. THE PINE LEAF SCALE
(N. J. Agr. Exp. Sta. Circ. 15)

The use of tobacco extract, 1 part to 500 parts of water, with the addition of a small amount of soap, is suggested as a spray to be directed against the young just as they are hatching. Several applications will undoubtedly be necessary. It is not feasible to use a corrosive spray during the winter on account of the danger to the ever-greens.

LE CONTE'S SAWFLY

(Lophyrus lecontei Fitch)

GENERAL APPEARANCE.—The larvæ are about 1 inch long, dirty yellowish, red headed, and black spotted. They feed in clusters on the outer branches of pines. The parent is a shining dull tawny yellow insect with antennæ, abdomen and the base of the thorax black.

LIFE HISTORY.—This species overwinters in a parchment-like cocoon under fallen leaves, etc., on the ground. The adults appear in spring

and deposit eggs in the leaves and the larvæ feed on the foliage. There are two broods, the larvæ appearing in July and again in September.

FOOD PLANT.—Pine.

CONTROL.—Spray with powdered arsenate of lead, $1\frac{1}{2}$ pounds to 50 gallons of water.

THE NANTUCKET PINE MOTII

(*Evetria frustrana* Scudd.)

GENERAL APPEARANCE.—The adult is a small copper-colored moth with a wing expanse of about $\frac{1}{2}$ inch. The larvæ are yellowish and mine the terminal bud.

LIFE HISTORY.—The insect hibernates as a pupa in a cocoon placed in the burrows or fastened to a twig. Adults emerge about the first part of June and probably deposit eggs on the buds. Upon hatching the larvæ spin a fine web around the terminal bud and mine the twig and bases of the leaves. The effect is hardly noticeable until the tip is almost completely destroyed.

FOOD PLANT.—Pine.

CONTROL.—Cut and burn infested tips.

THE EUROPEAN PINE SAWFLY

(*Diprion simile* Hartig)

GENERAL APPEARANCE.—The larva is about 1 inch long, having a black head, a greenish-yellow body with a mid-dorsal double brown stripe, and on either side of this a yellow stripe broken with brown markings. The remainder of the sides is dark brown with irregular yellowish or whitish spots.

LIFE HISTORY.—Overwintering takes place either in the sepia-colored cocoons attached to the twigs or among rubbish on the ground. Adults emerge in the spring and insert pale blue eggs in slits in the needles. The larvæ feed on the older needles for about one month before pupating. There are two generations.

FOOD PLANTS.—White pine, Japanese pine, Austrian pine, Scotch pine, Mugho pine, and several other species.

CONTROL.—Spray with arsenate of lead (powder), using $1\frac{1}{2}$ pounds to 50 gallons of water.

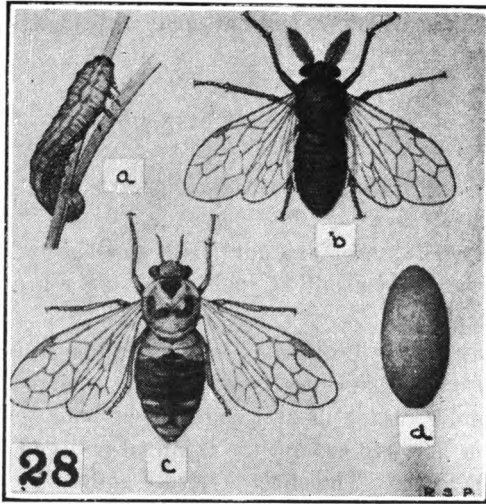


FIG. 28. THE EUROPEAN PINE SAWFLY
a, larva; b, male sawfly; c, female sawfly; d, cocoon
(N. J. Agr. Exp. Sta. Circ. 100)

THE EUROPEAN PINE-SHOOT MOTH

(*Evetria buoliana* Schiff.)

GENERAL DESCRIPTION.—The adult is a small, gayly colored moth with a wing spread of about $\frac{3}{4}$ inch. The forewings are orange suffused with red and having several forked, irregular, silvery crosslines. The larva is dark brown with deep black head when young, but becomes lighter as it gets older. It inhabits the buds and young shoots.

LIFE HISTORY.—The partly grown larva overwinters within a bud and resumes its feeding in the spring. It eats the entire interior of young shoots, causing their death, and injures larger shoots so that their erect growth is prevented and they bend downward at the injured place. Only the soft growth on which the needles have not yet appeared is attacked. When full grown it is about $\frac{2}{3}$ inch long. Pupation takes place within one of the hollow shoots and the moths emerge during July. Eggs are then laid singly at the base of the buds, upwards of 100 being deposited by each female.

FOOD PLANTS.—All species of pine are attacked by this insect.

CONTROL.—In nurseries, the infested buds should be cut off and destroyed during the fall and winter. They can be recognized at this

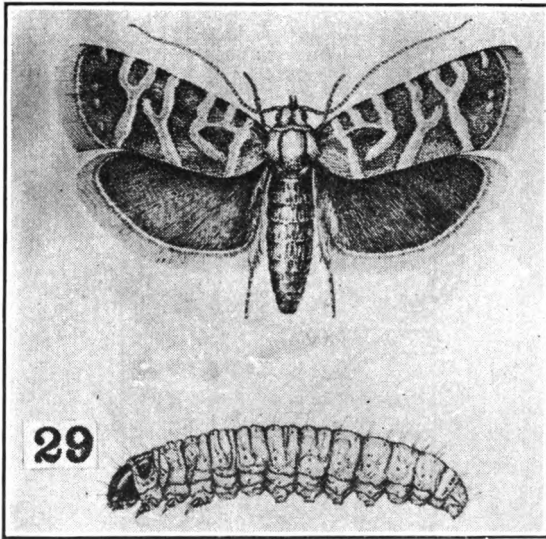
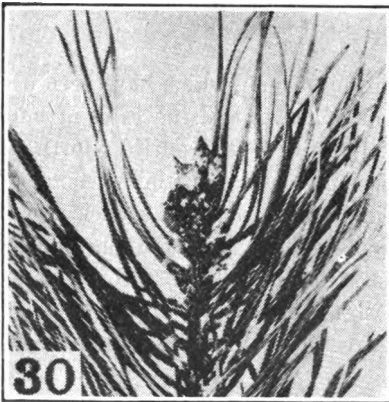


FIG. 29. THE EUROPEAN PINE-SHOOT MOTH
Larva and adult greatly enlarged
(U. S. Dept. Agr. Bul. 170)



FIGS. 30, 31. WORK OF EUROPEAN PINE-SHOOT MOTH
(U. S. Dept. Agr. Bul. 170)

time by the slight exudation of pitch over the entrance hole of the larva at the base of the bud. The trees should be gone over again in the spring so that overlooked infestations can be removed.

THE SPRUCE GALL-LOUSE

(Chermes abietis Linn.)

GENERAL APPEARANCE.—Cone-shaped, multicellular galls (containing plant lice) at the bases of young shoots indicate the presence of this species.

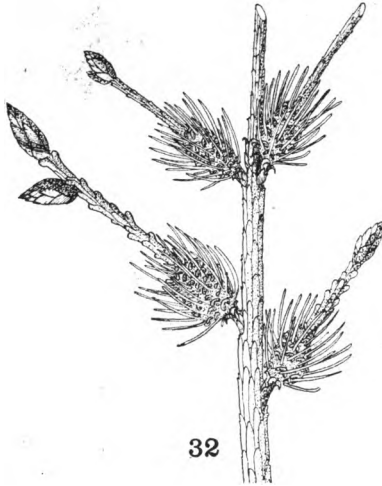


FIG. 32. WORK OF SPRUCE GALL APHID
(N. J. Agr. Exp. Sta. Circ. 15)

LIFE HISTORY.—The eggs are laid by forms (which have been overwintering in the crevices at the axils of leaves and the bases of buds) from the second week in May until the trees are putting forth new shoots. They are usually deposited at the base of the buds enclosed in a white woolly mass. They hatch in about 10 days or a week and the resulting young crawl to the base of a shoot and here the galls are gradually formed. They are at first green, but as the season advances, they become yellow and then in August they turn brown and open, allowing the lice to escape. Eggs are then laid which hatch and the young wingless females hibernate.

FOOD PLANTS.—Various species of spruces.

CONTROL.—Cut off and burn the galls during June and July while the lice are inside, or spray with whale-oil soap at the rate of 1 pound to 3 gallons of water during April.

THE ARBOR VITÆ LEAF MINER

(Argyresthia thuiella Pack.)

GENERAL APPEARANCE.—Plants injured by this insect have the terminal half inch of the leaves whitish or brown, giving the foliage a somewhat rusty appearance if the injury is abundant and destroying the ornamental effect of the plants.

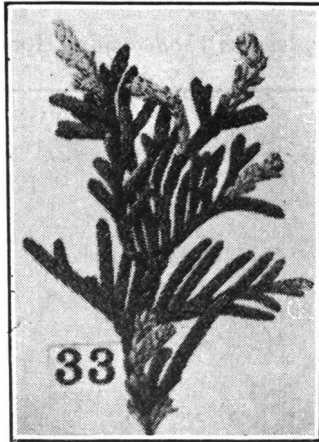


FIG. 33. ARBOR VITÆ SHOWING TIPS INJURED BY LEAF MINER
(N. Y. State Ent. 29th Rpt.)

LIFE HISTORY.—The parent is a small moth rarely noticed by the ordinary observer. The yellowish white larva mines the tips of the sprays and transforms to a pupa within the mined portion, the adults emerging during June.

FOOD PLANT.—Arbor vitæ.

CONTROL.—Cut and burn infested tips during the fall or early spring. The use of tobacco extract at a strength of 1 part to 600 parts of water, to which soap has been added, might be effective in destroying the young caterpillars if applied during July before they are well protected by the leaf tissues.

THE JUNIPER SCALE

(Diaspis carueli Targ.)

GENERAL APPEARANCE.—The female scale is snowy white, circular and about 1/25 inch in diameter, with a nearby circular yellowish

spot. The male scale is slender, white and about as long as the female, with a yellowish oval spot at the end.

FOOD PLANTS.—Juniper and arbor vitæ have been found infested.

CONTROL.—No method of control has been worked out. The scale is locally common only at times and thus far has done no apparent damage.

THE RHODODENDRON LACE BUG

(*Leptobyrsa rhododendri* Horv.)

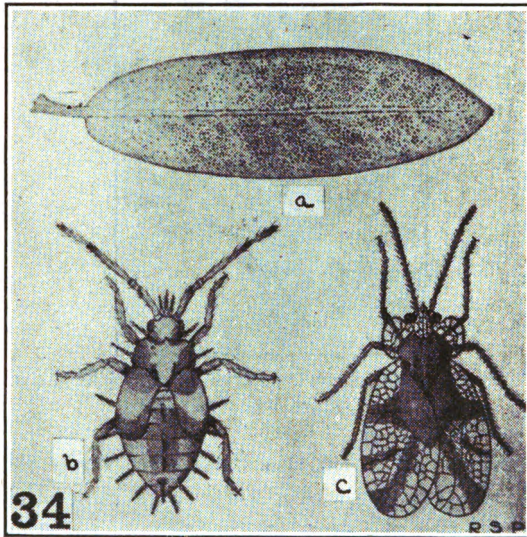


FIG. 34. THE RHODODENDRON LACE-BUG
a, under leaf-surface showing spotting; b, last stage nymph; c, adult
(N. J. Agr. Exp. Sta. Circ. 100)

GENERAL APPEARANCE.—This species is somewhat similar to the azalea lace bug, both in structure and in injury to foliage.

LIFE HISTORY.—Overwintering takes place in the egg stage, the eggs being somewhat irregular, cylindrical and flask-shaped and deposited in the lower leaf-surface usually along the mid-rib and covered with a scab-like material. Hatching takes place in May and there are two broods. Each insect goes through 4 nymphal stages, all of which require a combined time of about 1 month.

FOOD PLANTS.—Mountain laurel, rhododendron and many varieties.

CONTROL.—Spray with whale-oil soap at the rate of 6 pounds to 50 gallons of water. Apply to the under leaf-surfaces as soon as the nymphs are noted in the spring.

THE RHODODENDRON CLEAR-WING

(*Sesia rhododendri* Beutm.)

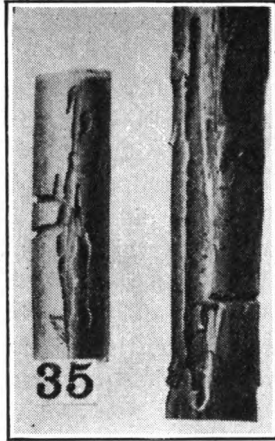


FIG. 35. WORK OF RHODODENDRON CLEAR-WING BORER IN STEMS
(N. Y. State Ent. 29th Rpt.)

GENERAL APPEARANCE.—The adult is one of the clear-winged moths which somewhat resemble wasps in color, markings and flight. A wilting or yellowing of the rhododendron leaves is an indication that the larva of this moth is working in the stem or branch.

LIFE HISTORY.—The moths appear in June and deposit eggs on the trunk, branches and twigs. The larva attacks the inner bark, later working into the sap-wood forming irregular galleries. It overwinters as a larva within a gallery, transforms to a pupa in May and later issues as a moth. Young plants or twigs are frequently girdled and soon wilt and die. Larger stems are also attacked and on account of the preference of the insect for previously injured places, the trouble increases from year to year and eventually results in the plant's death. As a rule, plants are not usually injured within one foot from the base.

FOOD PLANTS.—Rhododendron. Mountain laurel and azalea are also attacked if grown with rhododendrons.

CONTROL.—Cut and burn all dead or infested parts of the plants during the fall or winter.

THE PITTED AMBROSIA BEETLE

(Corthylus punctatissimus Zimm.)

GENERAL APPEARANCE.—The parents are small, shining black, stout cylindrical beetles about $\frac{1}{8}$ inch long. They work in the stem at the surface of the ground and their galleries so interfere with the flow of sap that the entire stem dies and readily breaks off at its base.

LIFE HISTORY.—The adults winter in the larval chambers or special galleries and are rarely observed. They are thought to be subterranean in habits. New plants are infested by the beetles entering the side of the stem at or close to the surface of the ground through a circular hole about $\frac{1}{16}$ inch in diameter. This leads to a series of galleries and brood chambers in which the larvæ dwell. All of the insect's operations appear to be confined to that portion of the stem between the crown and a distance of 3 or 4 inches above the ground, and directed against rhododendrons growing in abundantly mulched places. Rhododendrons growing in sunny, grassy areas escape injury.

FOOD PLANTS.—In addition to rhododendron, this borer has been found seriously damaging young sugar maples, and occurring in sassafras, dogwood, water-beech, ironwood, hazel and huckleberry.

THE AZALEA LACE BUG

(Stephanitis pyrioides Scott)

GENERAL APPEARANCE.—A whitening of the upper surfaces of azalea leaves and the presence of numerous small, spiny, sucking bugs, together with some having lace-like wing-covers laid flat on the body on the under leaf-surface, is an indication that the azalea lace bug is at fault.

LIFE HISTORY.—The winter is passed in the egg stage, the small, flask-shaped eggs being found in the leaf tissue close to the mid-rib. Hatching takes place the latter part of May and there are five nymphal stages, each one requiring from 3 to 6 days in which to mature. The entire life cycle requires about 1 month and 3 broods occur.

FOOD PLANTS.—*Azalea indica*, *Azalea amoena* and numerous other varieties. Evergreen varieties are more liable to injury.

CONTROL.—Spray with whale-oil soap at the rate of 6 pounds to 50 gallons of water, about the last of May or shortly after the overwintering eggs have hatched. The material should be directed against the under-sides of the leaves.

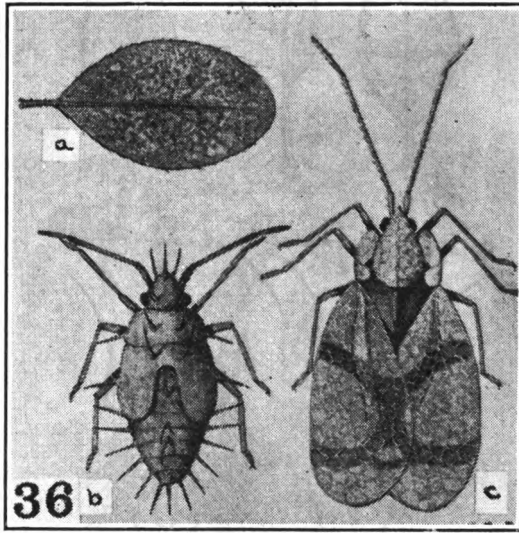


FIG. 36. THE AZALEA LACE BUG
a, injured leaf; b, last stage nymph. c, adult
(N. J. Agr. Exp. Sta. Circ. 100)

THE BOXWOOD LEAF MINER

(*Monarthropalpus buxi* Lab.)

GENERAL APPEARANCE.—The first sign of injury is a small, yellowish or light green spot on the upper leaf-surface. Directly under this on the lower surface is an irregular oval blister. Late in the season the injury is quite pronounced, the swellings are larger and the leaves become discolored. These blisters contain light orange or lemon-colored larvæ or pupæ about $\frac{1}{8}$ inch in length. The parent is a slender midge with hyaline wings and an orange-colored body.

LIFE HISTORY.—The midges appear during the latter part of May and first of June, having emerged from spring pupæ. Tiny, oval eggs are deposited in the young developing leaves and the resulting yellowish white larvæ mine the leaves all summer, making small oval pockets

between the upper and lower leaf-surfaces. The winter is passed as larvæ in these pockets and pupation occurs during the last of May.

FOOD PLANT.—Boxwood.

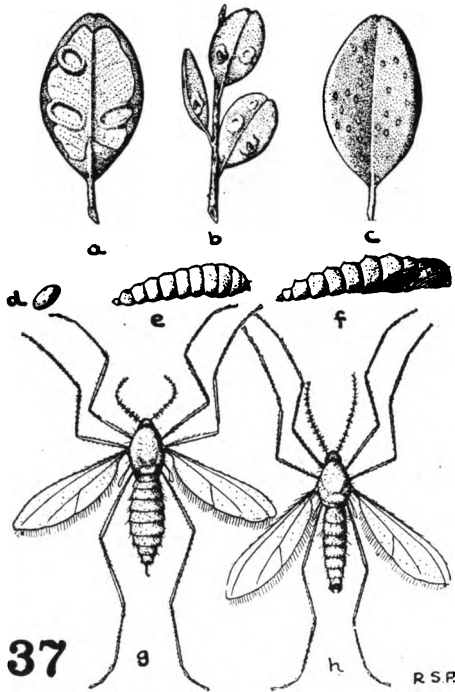


FIG. 37. THE BOXWOOD LEAF MINER

a, leaf with lower surface removed showing mines; b, leaves showing galls; c, leaf showing egg distribution when many females oviposit in a few leaves; d, egg; e, larva; f, pupa; g, female midge; h, male midge

CONTROL.—Badly infested plants are no longer ornamental and should be destroyed if possible. Trimming off the outer foliage, which is usually the most infested, during the late summer or early spring will get rid of many.

THE BOXWOOD PSYLLID

(*Psyllia buxi* Linn.)

GENERAL APPEARANCE.—The curling of the terminal leaves of boxwood, so that they resemble little cups or hollow hemispheres, is due to the work of this psyllid.

LIFE HISTORY.—This species was introduced from Holland, and according to Dutch authors, the adults appear in May and June and

the female deposits eggs on the leaves at the tips of the branches. These hatch and the nymphs which are clothed with a white waxy secretion suck the leaf juices causing the characteristic curling. Hibernation takes place by the partly-grown nymphs in the axils of the leaves and similar crevices.

FOOD PLANT.—Boxwood.

CONTROL.—Up to the present, this species has necessitated no control measures in New Jersey.

THE EUONYMUS SCALE

(*Chionaspis euonymi* Comst.)

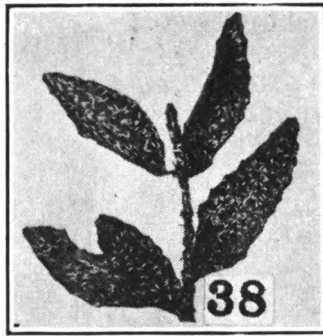


FIG. 38. THE EUONYMUS SCALE
(Conn. Agr. Exp. Sta. Bul. 151)

GENERAL DESCRIPTION.—This scale somewhat resembles the scurfy scale but the females are smaller, elongate oval and brown. The males, which are usually very abundant, are narrow and pure white. A badly-infested plant appears as if covered with snow.

LIFE HISTORY.—There are two broods and overwintering takes place by the females and in the egg stage, hatching beginning the last part of May or first of June.

FOOD PLANTS.—Different species of *euonymus*, both deciduous and evergreen, are subject to attacks by this scale.

CONTROL.—Spray deciduous plants during the winter with whale-oil soap at the rate of 1 pound to a gallon of water.

THE ROSE LEAF HOPPER

(Empoa rosæ Linn.)

GENERAL APPEARANCE.—This leaf hopper is a narrow, yellowish white, active creature about $\frac{1}{8}$ inch long. Signs of its presence are white spottings along the veins of the leaf.

LIFE HISTORY.—This insect overwinters as an egg just under the bark of the new growth. These hatch into whitish nymphs which resemble the adults and harmonize in color with the under-surfaces of the leaves. The nymphs live by extracting the sap from the leaves, moult five times and finally acquire wings, there being possibly three generations under favorable conditions.

FOOD PLANTS.—Rose, apple, blackberry, raspberry, strawberry, dogwood, prune, cherry and hawthorne.

CONTROL.—Spray the under-sides of the leaves with "Black leaf 40," 1 to 2,000 plus 5 pounds of soap for the young nymphs, and for older nymphs and adults increase the "Black leaf 40" to 1 to 1,200.

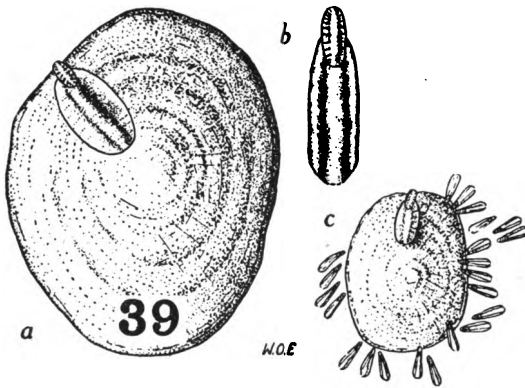


FIG. 39. THE ROSE SCALE

a, adult female scale; b, male scale; c, female scale surrounded by male scales
(N. Y. State Coll. Forestry Bul. 26)

THE ROSE SCALE

(Aulacaspis rosæ Bouche)

GENERAL APPEARANCE.—The female scale is snow-white, nearly circular and about $\frac{1}{10}$ inch in diameter. The male is white, thread-like and shorter than the female.

LIFE HISTORY.—This scale is very common and hibernates in all stages from egg to gravid female, mostly, however, as young scales of both sexes, male pupæ and full-grown females. Three broods occur in New Jersey.

FOOD PLANTS.—Roses, blackberry, raspberry and dewberry growing thick in damp, shady places are especially liable to infestation.

CONTROL.—Badly infested canes or shoots should be cut and burned. Lime-sulfur at the rate of 1 part to 9 parts of water, applied in winter or early spring, is said to be effective.

THE LILAC BORER

(*Podosesia syringæ* Harris)

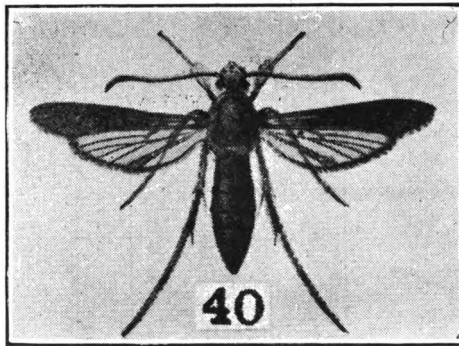


FIG. 40. THE LILAC BORER
(Ill. Agr. Exp. Sta. Bul. 151)

GENERAL APPEARANCE.—The larva or borer is variable in length and of a whitish color, being yellow anteriorly with a bright mahogany-colored head. Its activity produces large rough places on the trunks and branches. The parents are clear-winged moths which resemble wasps in color and movement and which have a wing spread of from 1 to 1½ inches.

LIFE HISTORY.—Eggs are deposited during the summer in masses on rough or knotty places and hatch in about one week. The young larvæ work in the sap-wood, entering the harder wood and even mining the centers of small branches. When full grown they plug up the burrow before and behind with frass and spend the winter in this way. Before pupation, which takes place in the spring, they burrow outward and cut their way through the bark almost to the outside, so

that only a thin film remains. The pupa, by reason of its abdominal armature, works its way partly out of the chamber so that the moth which emerges in the summer will have no trouble in escaping.

FOOD PLANTS.—In New Jersey nurseries this insect has been found infesting lilacs to such an extent that the plants were permanently injured and readily broken over. It has also been recorded as injuring mountain ash and the white, green and English ashes.



FIG. 41. BURROWS IN ASH, MADE BY LARVÆ OF LILAC BORER
(Ill. Agr. Exp. Sta. Bul. 151)

CONTROL.—Infested branches should be cut and burned in the winter. Several applications of arsenate of lead to rough, knotty and injured places on the bark is suggested as a means of preventing infestation.

THE DOGWOOD TWIG-GIRDLER

(*Oberea tripunctata* Swed.)

GENERAL APPEARANCE.—The presence of this borer is first indicated by a withering of the leaves at the tip of the girdled shoots. The

parent is a cylindrical beetle about $\frac{1}{2}$ inch long and less than $\frac{1}{8}$ inch in diameter, and the larva is found in infested stems.

LIFE HISTORY.—In New Jersey eggs are deposited during June and July and hatch in about ten days, the young larva burrowing downward in the twig and boring through to the outside at intervals so that its excrement can be discharged. Before depositing the egg the beetle girdles the tip of the twig so that the tip finally breaks off.

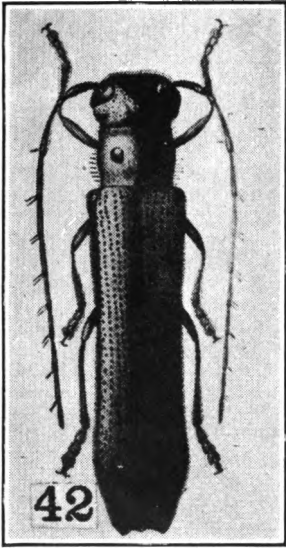


FIG. 42. THE DOGWOOD TWIG GIRDLER
(Ill. Agr. Exp. Sta. Bul. 151)

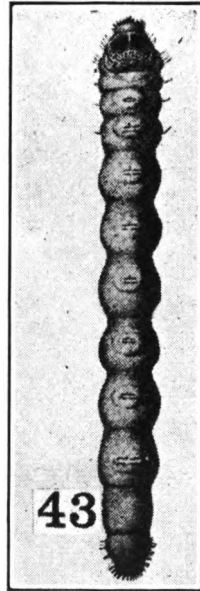


FIG. 43. LARVA OF DOGWOOD TWIG GIRDLER
(Ill. Agr. Exp. Sta. Bul. 151)

A second girdle, not so deep as the first one, is then made about 2 or 3 inches lower down and between these 2 girdlings 2 parallel cuts and a transverse slit are made, forming a flap, beneath which the egg is pushed. The effect of all this is to check the flow of sap in the section surrounding the egg. The winter is passed as a full-grown larva in the burrow and pupation takes place in May, the adults emerging during the latter part of May and being on the wing through to August.

FOOD PLANT.—Dogwood.

CONTROL.—This insect can be controlled by cutting and burning infested shoots any time except during the summer when the beetles are on the wing.

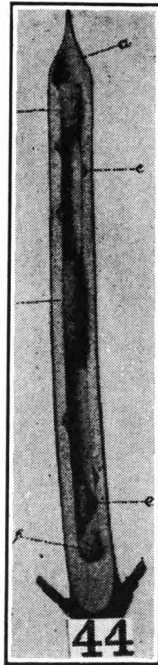


FIG. 44. CORNUS TWIG WITH BURROW OF DOGWOOD TWIG GIRDLER SHOWING
(Ill. Agr. Exp. Sta. Bul. 151)

References Consulted

- Blackman, M. W., and Ellis, W. O. Some insect enemies of shade trees and ornamental shrubs. *In* Bul. N. Y. State Coll. Forestry, V. 16. No. 26.
- Britton, W. E., 1905. The chief injurious scale insects of Connecticut. Conn. Agr. Exp. Sta. Bul. 151.
- Britton, W. E., 1913. The Apple Tree Tent Caterpillar. Conn. Agr. Exp. Sta. Bul. 177.
- Britton, W. E., 1915. 15th Rept. of State Ent. Conn.
- Britton, W. E., 1916. 16th Rept. of State Ent. Conn.
- Busck, A., 1915. The European Pine Shoot Moth. U. S. Dept. Agr. Bul. 170.
- Ewing, H. E., 1914. The common Red Spider or Spider Mite. Ore. Agr. Exp. Sta. Bul. 121.
- Childs, L., 1918. The life history and control of Rose Leaf Hopper. Ore. Agr. Exp. Sta. Bul. 148.
- Felt, E. P., 1906. Insects affecting park and woodland trees. N. Y. State Mus. Mem. 8, Nos. 1-2.
- Felt, E. P., 1911. 27th Rept. State Ent. N. Y. N. Y. State Mus. Bul. 155.
- Felt, E. P., 1913. 29th Rept. State Ent. N. Y. N. Y. State Mus. Bul. 175.
- Felt, E. P., 1914. 30th Rept. State Ent. N. Y. N. Y. State Mus. Bul. 180.
- Forbes, S. A., 1911. Some important insects of Illinois shade trees and shrubs. Ill. Agr. Exp. Sta. Bul. 151.
- Garman, H., 1916. The Locust Borer. Ky. Agr. Exp. Sta. Bul. 200.
- Herrick, G. W., 1913. Control of two elm-tree pests. N. Y. (Cornell) Agr. Exp. Sta. Bul. 333.
- Howard, L. O., and Chittenden, F. H., 1916. The Bagworm. U. S. Dept. Agr. Farmers' Bul. 701.
- Howard, L. O., and Chittenden, F. H., 1916. The Leopard Moth. U. S. Dept. Agr. Farmers' Bul. 708.
- Howard, L. O., and Chittenden, F. H., 1916. The Catalpa Sphinx. U. S. Dept. Agr. Farmers' Bul. 705.
- Matheson, R., 1915. Experiments in the control of the poplar and willow borer (*Cryptorhynchus lapathi*). *In* Jour. Econ. Ent., V. 8, pp. 522-525.
- Quaintance, A. L., 1916. The Oyster-Shell Scale and the Scurfy Scale. U. S. Dept. Agr. Farmers' Bul. 723.
- Sanders, J. G., 1909. The Euonymus Scale. U. S. Dept. Agr. Bur. Ent. Circ. 114.
- Schoene, W. J. The Poplar and Willow Borer. N. Y. State Agr. Exp. Sta. Bul. 286.
- Smith, J. B., 1902. The Rose Scale. N. J. Agr. Exp. Sta. Bul. 159.
- Wade, O., 1917. The Sycamore Lace-Bug. Okla. Agr. Exp. Sta. Bul. 116.
- Weiss, H. B., and Patterson, R. S., 1912. Nursery insects. N. J. Agr. Exp. Sta. Circ. 15.
- Weiss, H. B., 1918. Insect enemies of greenhouse and ornamental plants. N. J. Agr. Exp. Sta. Circ. 100.

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